The Chemical Age

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Price and Quality

THE Jubilee Memorial lecture delivered at Ottawa this year by Mr. Foster Sproxton contained a great deal that was interesting to those engaged in chemical development. No doubt the facts that he put forward are well known to those engaged wholly in the plastics industry and in many respects the lecture was in the nature of a text-book. The plastics industry is an outstanding example of the tendency of chemistry to find new materials to take the place of older natural products. In so doing, the natural products may be "improved" or replaced by something a little more useful and consequently with wider applications. They will generally be cheapened, often very considerably cheapened, for if the synthetic product is not cheaper than the natural product there is no justification for its production commercially unless the natural product is too restricted in quantity for the available market. Even then, the influx of additional supplies, even of a "substitute" will be likely to cause a fall in prices.

For any material that is to be used in quantity, therefore, cheapness of production must rank high in the list of essentials. Once the necessary low cost has been secured and the properties of the new material are satisfactory, the way is open to the inception of new labour-absorbing industries. A recent report by the Labour Party on the production of oil from coal shows that this application of modern chemistry is being appreciated by those who are not chemists. Writing of the possibilities of cheapening the process by research, the authors say: "The present gap between the price of the imported product and the coal product need not be permanent. . . . The first pair of artificial silk stockings were prohibitively expensive compared with silk stockings; now every girl in the country can buy artificial silk stockings. The experience of the rayon industry is matched by the synthetic ammonia and other trades. . . . Arguments from present costs are not conclusive."

It is unfortunate, in a sense, that the lecturer in tracing the development of the plastics industry did not give cost figures for various periods. Had he done so, doubtless it would have been shown that the extension of the use was a function of the improvement in the properties of the material and of the price. We were prompted by this lecture to read Dr. Baekeland's remarks when, in 1916, he was presented with the Perkin Medal. It will be remembered that although Baekeland developed, and in a great measure discovered, the phenol-formaldehyde resins to which he gave his name, there was already in existence the nitrocellulose product "celluloid," and it was in use for many purposes for which it seemed possible that bakelite might compete. It is interesting to notice that for some reason, perhaps connected with the development of bakelite, production of the cellulose plastics, even with the technical improvements that have developed non-inflammable cellulose products, has not greatly expanded. The world production was estimated at 30,000 tons in 1913, and only 35,000 tons in 1924. It has, however, grown rapidly in the U.S.A. and in Japan.

Dr. Baekeland, in 1909, decided that his material must in the first instance fill a definite need, and its value was not in the early stages to be measured in terms of price. Probably most new materials start in that way. He said, to quote his own words: "At the beginning I committed the mistake of trying to make the processes and the material as inexpensive as possible, using mostly the cheaper cresols, being guided by the idea that cheapness is a paramount consideration in the manufacture of plastics. It took me some time to find out that the best chances for bakelite lie where special technical effects are more important than mere cheapness, and that there is no use in wasting time and money trying to introduce a new process where about the same results could be obtained by the older plastics."

That attitude is probably correct in the early stages, when the output expected is modest, but when the market for the higher-priced product is saturated, frequently reduction in price will, alone, lead to expansion. It is significant that the output of phenol plastics grew in the U.S.A. from 6,900 tons to 39,000 tons within the period 1932-36, in Germany between 1933-36 from 8,700 tons to 14,800 tons, and that the present annual world output is worth £150,000,000. Mr. Sproxton significantly remarks that the great development of phenol plastics "has been due partly to their cheapness and partly to the contemporary growth in the use of electrical appliances."

The rapid invasion of chemistry during the last twenty years by the new methods and theories of physics has put an extra load on the students and teachers of chemistry at our universities. . . . My suggestion is, therefore, that every important university department of chemistry should have associated with it, as a member of the staff, a professor, or at least a reader, in theoretical chemistry.

Professor F. G. Donnan.

Notes and Comments

Proposed Manufacture by a Marketing Board

AN inquiry was opened in London last week into proposals empowering the Potato Marketing Board to manufacture alcohols and derivatives from potatoes, and also synthetic resins and plastics. Strenuous opposition to the scheme on behalf of the chemical and plastics industries was expressed in the evidence of Mr. J. Davidson Pratt, general manager of the Association of British Chemical Manufacturers; extracts from this evidence are given on the opposite page. The granting of these powers to the Board would create a precedent of danger to the chemical industry; it would mean the establishment of a Government-subsidised manufacturing organisation to operate in direct competition with individual manufacturers. Further, the proposed manufacture would utilise surplus potatoes and these surpluses being of varying quantity would not give a steady and economic production. This is confirmed by the results of attempts at this production abroad; there can be no objection to the profitable utilisation of a material which would otherwise go to waste, but every objection when that utilisation gives little promise of being profitable and is subsidised to the detriment of existing industries. The inquiry opened again in London yesterday and will close after further evidence has been heard in Edinburgh.

New Analyses of Prontosil

SINCE the discovery of the valued therapeutic properties of 4-aminobenzenesulphonamide (Prontosil Album) in streptococcal infections, a large number of related compounds have been tested. As a result of these investigations it has been found that 4-aminobenzenesulphonanilide is just as effective as the sulphonamide and also that the presence are amino group in the para position to the sulphonamide group is necessary for therapeutic action. Webster and Powers in the current issue of the journal of the American Chemical Society now describe the preparation of a series of derivatives of 4-aminobenzenesulphonanilide in which the hydrogen atom of the anilide ring is substituted by a nitro, amino, or hydroxyl group. Full experimental details of the methods of preparation of the new derivatives are given, but the tests of therapeutic activity have not yet been completed. However, it is stated in guarded terms that preliminary reports indicate that several of these compounds show some slight protective action against experimental streptococcal infections, and one, 4-acetaminobenzenesuphon-4-aminoanilide, is described as moderately effective.

Manufacturing Facilities in the Humber Area

IN selecting the site for his factory, the prospective manufacturer has to give most careful consideration to the accessibility of the raw materials required in the manufacturing process it is proposed to undertake and to the nature of the "services" (electric power, gas, water, etc.). These factors, and the case of transport of his manufactured goods to the consumer, have the greatest influence on his choice. Logically, the raw materials problem comes first as this determines the most suitable district and then the services, as fixing the most suitable area in that district. Usually information regarding the services of an area is readily obtained, but this is not the case with the raw material supplies. For this reason, the "Survey of Industries," published by the City of Hull Development Committee in 1936 had an excellent reception. A new and revised edition of this survey, compiled by Arnold R. Tankard, F.I.C. (City Analyst), in conjunction with the Hull University College, has now been published and can be obtained from the Secretary of the Development Committee. The survey consists of a general index to a very extensive list of raw materials and products, particularly those of interest to the newer branches of the chemical industry which are mentioned in the 54 pages of tables and descriptive matter. An interesting table is the list of the principal imports at the Port of Hull, showing the uses of these imports and the descriptions of the many finished articles which are derived from the raw materials. The survey shows that Hull, with its immediate neighbourhood, is advantageously placed for the manufacture of many articles which require large quantities of alcohol, acetone, acetic acid and butyl alcohol, and other solvents and related chemicals.

Unsatisfactory Position of Overseas Trade

IT must be admitted that the overseas trade returns for June are again indicative of an unsatisfactory position with a fall in imports of slightly over £11½ millions and in exports of £7½ millions in comparison with the corresponding month of the previous year. The visible adverse balance is, however, somewhat less than in May, 1937. Foreign trade in chemicals has also decreased, imports dropping in value by nearly £200,000 and exports by £590,000, compared with the same period. In a memorandum submitted to the President of the Board of Trade, the Federation of British Industries expresses concern at the recent tendency of overseas trade. In 1935 the United Kingdom had a favourable balance of payments of £32 millions, and in 1937 an unfavourable balance of £52 millions. Although the trading conditions in these two years are not strictly comparable, they can only be held to be responsible for the relatively small effect. From the facts of the present world situation it is considered, in the memorandum, that an assumption that the position will right itself automatically is unwarranted and that an expectation of the present tendency continuing would be more prudent.

Exceptional Circumstances of Municipal Borrowing

SIR ERNEST BENN had some trenchant things to say in his recently published book, "Debt," on the exceptional circumstances surrounding the modern phenomenon of municipal borrowing. He carried his argument, which is of vital importance to the trading community as a whole, a stage further on Thursday with the publication of a letter in *The Daily Telegraph*. His contention is that there has been created a borowers' market in which local authorities seem to regard it as an honour to the lender to allow him to lend. Little or no regard appears to be paid to the quality of the borrower; indeed a new set of standards seems to have arisen. He takes the case of the £2,000,000 loan recently placed by the Leeds Corporation at 3¼ per cent. "As a trustee," he says, "I can find no justification for lending money to Leeds at this low rate of interest. There is no adequate reference to provision for redemption. No particulars are given of the purposes to which this new £2,000,000 is to be applied. There is no mention of anything in the nature of an audit, and no particulars are offered of the profits or losses on the Corporation trading accounts." Sir Ernest Benn adds that there are many worse cases, which he takes to be clear indicators of widespread local authority bankruptcy.

Chemical Manufacture by Potato Marketing Board

Proposals Opposed by Association of British Chemical Manufacturers

PROPOSALS under which the Potato Marketing Board would be given powers to produce alcohols and synthetic organic chemicals prepared from ethyl alcohol from potatoes, were opposed by the Association of British Chemical Manufacturers, during an inquiry at the High Court, London, on July 15. The inquiry commenced on July 11, and continued all the week. It was resumed in London yesterday; the hearing in Edinburgh, due to start on Monday, was postponed. On July 15, all the evidence relating to the chemical and plastic industries was given by Mr. J. Davidson Pratt, general manager of the Association of British Chemical Manufacturers, also representing British Industrial Plastics, Ltd., the British Plastics Federation, Ltd., Bakelite, Ltd., and the Federation of British Industries.

An Organisation with Monopolistic-Powers

Mr. Pratt said that a formal objection had been entered by the Association of British Chemical Manufacturers, in which it stated that in Clause 74, the Potato Marketing Board sought powers to manufacture alcohol, synthetic organic chemicals from ethyl alcohol, and plastic and synthetic resins for use in the moulding, varnish and paint industries. The Association desired strongly to oppose in principle the grant of these powers. The Potato Marketing Board was constituted by Act of Parliament to control and regulate the marketing of potatoes. It was, in effect, a semi-State organisation with monopolistic powers, which enabled it, if it desired, to meet any losses which might occur from the proposed extension of its activities into manufacturing fields from the fund which it could create from levies on its members, and from profits made in the sale of potatoes. This enabled it to compete unfairly with established industry. As far as the products referred to were concerned, the chemical industry was highly efficient, and able to meet all requirements, so that additional production would be at the expense of established concerns.

Furthermore, since the suggested manufacturers would be based on surplus potatoes, and since surpluses would be of an extremely variable and erratic nature, incapable of prediction, the Potato Marketing Board's factories would be unable to operate at a steady load and, in fact, might have to close down for a considerable period. This meant that their production, being erratic, could not be economic. It was appreciated that the underlying object was to find an outlet for surplus potatoes, so that waste might be eliminated and the grower receive the maximum benefit from his crop. Quite apart from the unfair competition which was likely to accrue, it was felt that the method suggested was undesirable in the national interest, and that the object in view could be better achieved by co-operation and consultation with existing industries which were capable of using potatoes as a raw material. In this way it should be possible to avoid waste and dispose of surplus material without detriment to established manufacturing concerns.

Mr. Pratt said that besides objection to the powers sought already referred to, objection was also taken to the additional power that " The Board may buy surplus potatoes and sell potatoes bought by them, whether or not they are surplus potatoes at the time of sale " insofar as these powers bore on the manufacture of chemicals and plastics. With regard to the status of the Association of British Chemical Manufacturers, it was the trade association for the chemical industry as a whole, and since it was founded in 1916, had been recognised by the Government and Government Departments as the authoritative mouthpiece of the industry on all matters, except labour questions, with which he did not deal. The Association had no actual trading activities and did not buy or sell, and neither did it regulate or control prices in any way. It was fully representative of the industry and the capital represented by its membership was estimated to exceed £200,000,000. Among its members were included practically the whole of the interests engaged in the production of chemicals used under sub-clause (iv). While the plastics industry was represented by the British Plastics Federation, Ltd., there were also a few plastics firms among the members of his Association.

Continuing, Mr. Pratt said that the British Plastics Federation, Ltd., was a comprehensive organisation representing raw material manufacturers, including cellulose, celluloid and casein; moulding powder and allied material manufacturers; trade moulders, consumer moulders, speciality moulders; plant makers; mould and tool makers; synthetic resin and varnish manufacturers, and laminated material manufacturers. In order to save the time of the inquiry, the Federation of British Industries had sent in a general memorandum, but did not propose to attend the inquiry to give evidence.

Mr. Croom Johnson, K.C., on behalf of the Potato Marketing Board, objected to the memorandum being put in at that stage, as included in the representation of the Federation of British Industries were people who had already given evidence.

Mr. Le Quesne, K.C., the Commissioner, said that Mr. Pratt could put it in as a statement on behalf of the objectors generally, which he did.

Continuing, Mr. Pratt said that he would like to stress the point that the Potato Marketing Board from its constitution was primarily a marketing organisation, and it could never have been the intention of Parliament to set up manufacturing organisations under the umbrella of the Agricultural Marketing Acts, as these Acts in effect created statutory bodies with monopolistic powers. The Association he represented did not object at all from normal competition from bodies similarly constituted as their own, but they did fear competition from a body which would have very much wider powers. There was a general point of special applicability to chemical manufacture which he would like to emphasise, namely that irregular supplies of raw materials, resulting in the intermittent operation of the plant, was likely to have serious effects on the economics of the processes, because of the fact that corrosion and deterioration were always more rapid when the plant was working spasmodically than when it was run in continuous operation, particularly in the case of chemicals.

Fusel Oil in Alcohol Production

He wished to deal in detail with sub-clauses (iv) and (v). With regard to the first part of sub-clause (iv) dealing with alcohols, it was well known that ethyl alcohol could be made directly from potatoes, and this method was used in certain countries. With the ethyl alcohol, there was associated as a by-product, a small percentage, one to two per cent., of the higher alcohols or the bigger sister, generally referred to as fusel oil, the main product being amyl alcohol, but unless production was on a large scale, the quantities of fusel oil were too small to be of commercial importance. While butyl alcohol could also be made from potatoes by a special process, the most readily obtainable product was ethyl alcohol. His observations regarding the latter applied, however, also to butyl alcohol, the other main product.

In order that the manufacture of ethyl alcohol from potatoes might be economic and competitive with the alcohol made from the present raw material, molasses, it was estimated that the potatoes had to be available at a cost of between 10s. and 12s. 6d. a ton under present conditions. He did not think that was a very good price from the point of view of the farmer, but that was the price the manufacturer could pay for it at his factory. This took into account the cost of

the additional plant and treatment which was not required with molasses. The actual figure would vary from time to time, and would depend on all the factors operating at the particular time. The present manufacturing capacity of the country was more than adequate for any existing or anticipated demands. The firms concerned had been engaged in the industry for many years, and the processes operated with maximum efficiency, and were so maintained by continuous research and development.

The Position in Eire

It was pertinent to note that a recent report by their Trade Commissioner in Holland stated that the trials which were there undertaken in connection with the manufacture of ethyl alcohol from surplus potatoes had been abandoned, said Mr. Pratt. There had been considerable opposition to a similar scheme in Eire—the Irish Free State—on economic grounds, and also on account of the irregularity in the supply of potatoes. The latest information was that the potato alcohol factories were closed until next October, when it was proposed to restart them and carry on continuously, as molasses tanks were being installed, so that molasses could be used when potatoes were not available. The objections to the present proposals of the Potato Marketing Board would be intensified if there was any suggestion that the Board would be allowed to purchase other raw materials to keep its plant running. As ethyl alcohol was the primary product from which the organic chemicals mentioned in the concluding portion of sub-clause (iv) would be made, the makers of ethyl alcohol had stated they were willing to co-operate with the Board if conditions made it economic to use potatoes in this way.

Starting with ethyl alcohol as a raw material, a whole series of organic chemical products could be made, of which the most important were ether, ethyl chloride, ethyl acetate and other ethyl esters, acetic acid, acetone, acetaldehyde, acetic anhydride, butyl alcohol and ethylene glycol. The products had a variety of applications and were used in practically every industry. The Board were asking for powers to manufacture ethyl alcohol and the organic chemicals he had referred to, prepared from ethyl alcohol. The manufacture of those chemicals was a highly technical and specialised branch of chemistry, requiring constant research, both into processes, plant and application, to maintain their competitive efficiency both internally and against the foreigner. The British industry had capacity more than capable of meeting all present and anticipated demands of these products at competitive prices, so that additional production would be at the expense of established concerns. The industry was also highly efficient in every respect and maintained progressive research organisations. The manufacture of these substances required the use of other chemicals which the Board would have to buy.

Mr. Pratt submitted that the Potato Marketing Board would find itself in a difficulty in undertaking these manufactures, because of the patent situation. While no difficulty would arise with ethyl alcohol, the best processes for most of the others were protected by patents, so that the Board would either have to use less efficient processes, or discover and develop new methods of its own. Long, intensive and costly research might be required to devise new processes, and put them on the market on a commercial basis. The Board if it was to exercise its powers, would have to become a full fledged chemical manufacturing organisation. It would require an active research branch if it was to operate with reasonable technical efficiency, and it would need to set up the necessary machinery for the sale of its products and the provision of the requisite technical service to its customers which were to be found in practically every industry. Technical service in the chemical industry was of first rate importance, and was becoming more so daily. Considerable capital would be required for the erection of the plants and for the associated directing, operating, research and selling branches. These would have to operate under the serious handicaps imposed by intermittent and variable supplies of raw materials unless the Board's powers allowed it to purchase alternative raw materials or potatoes from abroad.

Mr. Croom Johnson interposed, and said he would dispose of that objection at once by saying that the Board did not have power, and had not asked for power, to purchase potatoes from abroad.

Continuing, Mr. Pratt said that Mr. Croom Johnson, in his opening statement, had referred to surpluses being restricted to a locality and being of a temporary nature. Further, he said it was not economic to ship potatoes from district to district to any great extent. That was in reference to potatoes for human consumption which fetched a good price, and it would therefore necessarily apply to surplus potatoes which sold cheaply. There would have to be factories in different parts of the country to deal with local surpluses. He was talking purely from a chemical point of view, as it would make production in any one of the factories uneconomic. Considerable liabilities would therefore be incurred by the Potato Marketing Board, and these must eventually fall on the producers of potatoes. He therefore submitted that the grant of these powers was not in the best interests of all the producers and should be refused on this ground alone, quite apart from the objections raised from the purely industrial side.

Dealing with sub-clause (v), Mr. Pratt said that they had no knowledge of any plastic or synthetic resin at present made direct from potatoes, or indirectly where the principal component was obtained directly from potatoes. It was possible that certain of these materials could be made indirectly through ethyl alcohol, but none of the principal processes employed at present used ethyl alcohol as a prime component. It could not be too strongly stressed that even in the processes where other alcohols were used, many additional substances were required before plastic could be made. In this connection, he referred to what was generally regarded as the most embrasive book on synthetic resins, "Chemistry of Synthetic Resins," by Carleton Ellis, 1935. Inspection of the index revealed only one reference to the use of potatoes, and on examination of the cited works, it was found that of the constituents, carbolic acid, formaldehyde, naphtha, sulpho-acids and potato flour, the latter comprising only 11 per cent. of the whole, so that the product could hardly be described as being obtained from potatoes. So far as was known, the process described was not being worked commercially.

Board Seeking Very Wide Powers

It was submitted by Mr. Pratt that in section 5 (a) of the Agricultural Marketing Act, 1931, the words "to produce such commodities from that produce" were intended to include only such commodities as could be prepared with reasonable directness from the product with which the scheme was connected. At present, the amendment did not clearly limit the powers of the Potato Marketing Board. The powers they were seeking were very wide, and it might be possible to use some chemical obtained from potatoes in any manner, however indirect, as a minor ingredient in the production of plastics. The exercise of the Board's powers in such a way would be a radical departure from the purpose of the scheme and the Acts of Parliament relating to such scheme. He suggested that provisions of such extensive and not clearly defined powers should not be allowed, notwithstanding the provisions made for the lodging of complaints to the Minister as to the operation of any scheme. He further submitted that in view of the remarks he had made "the amendment will" not "conduce to the more effective operation of the scheme" in accordance with the Agricultural Marketing Act, 1931, Part II, 1 (c) (i). If it was the intention of the Board only to use surplus potatoes in the production of plastics, this should be specifically provided for if any additional powers were granted.

Continuing, Mr. Pratt said that if the Potato Marketing Board had developed, or had knowledge of direct methods of

production, the plastics industry would be glad to put its wide experience at the Board's disposal, to advise the Board as to the commercial development, if such could be shown to be economic. What had been said regarding organic chemical products applied with equal force in the field of plastics. The industry was extremely competitive because of the variety of types of plastics. It was very specialised, highly efficient, maintained active research organisations, and had adequate capacity to meet all present and anticipated demands. He submitted it would be better for the Board to wait until the situation arose, when the matter could be examined in the clear light of all the facts, and then the necessary additional powers would be granted if it was considered to be justified in the interests of all concerned.

The industries he represented were not afraid of competition of the normal type, but they felt that the powers which the Potato Marketing Board had and were seeking, could be used, and rendered the competition unfair. It was true that Mr. Croom Johnson had said that the Board had no intention of using these powers in an unfair way, and they had no intention of going bald-headed into uneconomic production. He accepted his assurances that such were the intentions of the Board at the present time, but he woud like to know what was the legal value of such assurances. Did they bind the Board at the moment, and did they bind the Board for all time? What would happen in five, ten, fifteen or twenty years time when this inquiry would probably have been forgotten, when some of them were possibly engaged in other pursuits, and when the personnel of the Board had changed. Those assurances were meaningless and valueless when they took the long point of view. They were dealing with something which might have a very serious effect within five to twenty years, and the argument that they had no intention of doing so should not be regarded as an argument necessarily justifying the Board obtaining the powers. It was not permissible to criticise powers already granted, and therefore it was going to be extremely difficult if wide powers were granted now, to get them reduced later on, and such powers should only be granted if it was shown that they were really in the interests of the producers of potatoes.

In conclusion, Mr. Pratt said that the industries he represented appreciated that the underlying object was to find an outlet for surplus potatoes so that the waste might be eliminated, and the grower obtain the maximum benefit from his crops. At the same time, they felt that the grant of the powers now desired was objectionable from the point of view of the grower and of existing industry. They therefore submitted that if surplus potatoes were available, the utilisation should be left to established industries, working in close co-operation with the Potato Marketing Board, as in this way the surplus could be utilised where suitable and economic without detriment to the established manufacturers and without dislocation of the markets. The industries that he represented would be prepared to help in this way, and in order that they might have some idea of the magnitude of the problem, would be glad to be furnished by the Board with a statement showing the annual surplus of potatoes over the last five years. He submitted that a case had been made out that no wide manufactory powers should be granted, and the amendment should not be made.

Mr. Pratt called no evidence, and the inquiry adjourned after hearing evidence by other objectors.

Detecting Poisonous Gases in Industry

Tests for Hydrogen Cyanide Vapour

THE Department of Scientific and Industrial Research has now issued the second of a series of leaflets describing standard methods for the detection of toxic gases in industry. The present leaflet (Stationery Office, price 5s. 6d.) deals with hydrogen cyanide (prussic acid). Leaflet No. 1 published a short time ago related to hydrogen sulphide.

Hydrogen cyanide is manufactured mainly for use in the fumigation of ships and buildings. It is also used to a small extent industrially as a reagent. Further, it is encountered in concentrations which may be dangerous in certain industrial processes—blast furnace plants, dyestuffs works, gasworks and coke ovens, and in the industries of gold mining and gilding. The leaflet points out that slight symptoms of poisoning will be noticed after several hours with a concentration of one part by volume in 50,000, while a concentration of one part in 500 will be fatal. It goes on to say "in addition to the danger of the inhalation of hydrogen cyanide vapour there is a further danger, even to a man equipped with an efficient respirator or other form of breathing apparatus. This danger is the absorption of hydrogen cyanide through the skin, which is still greater if the skin is wet with sweat, owing to the ready solubility of hydrogen cyanide in water. The faint, almond-like smell is easily missed and it quite unsuitable as a method of detection."

The method of test adopted consists of drawing a sample of the suspected atmosphere by means of a hand-exhausting pump through a piece of specially-prepared test paper. Full instructions for preparing the test paper and for carrying out the test are given in the leaflet. The various reagents which will react to hydrogen cyanide are reviewed and those recommended are Congo-Red-silver nitrate and benzidine-copper acetate which are capable of detecting concentrations down to one part in 100,000. Test papers treated with these reagents will show characteristic stains, specimens of which are included with the leaflet. Both reactions have been made quantitative.

While the information is addressed primarily to responsible works officials, medical officers, chemists and other persons in charge of chemical plant, the tests themselves have been made as simple and straightforward as possible in order that they can be operated, given the necessary materials, by comparatively unskilled personnel. The main object of the test should not be to obtain an extreme degree of accuracy, but to give a rapid indication of the relative safety of the atmosphere. It will, of course, ony indicate the presence of hydrogen cyanide and in cases where any other gas is liable to occur, the relevant test for it must be applied before the atmosphere is adjudged as safe to breathe.

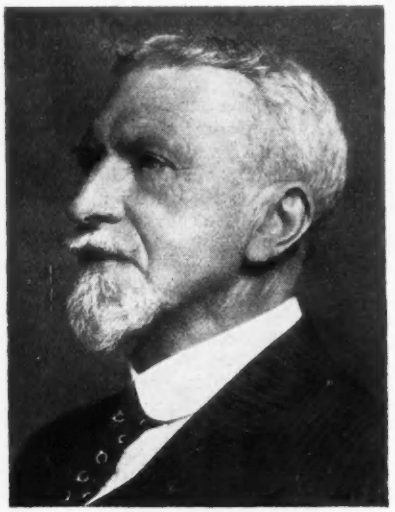
A foreword to the leaflet explains that a paragraph of the Chemical Works Regulations, 1922 (made under Section 79 of the Factory and Workshop Act, 1901) prohibits entry into any place which might contain dangerous gas by any person not properly protected until the air has been tested and found safe to breathe. To meet this requirement the question of simple and rapid chemical or other methods for determining low concentrations of dangerous gases, such as may occur in various circumstances in chemical works, was discussed by the Association of British Chemical Manufacturers with the Home Office and as a result arrangements were made by the Department of Scientific and Industrial Research, at the request of the Home Office and with the financial and technical co-operation of the Association of British Chemical Manufacturers, for a series of tests to be developed by the Chemical Defence Research Department.

The complete series of tests when published will include the following gases and vapours: Aniline, arsine, benzene, carbon bisulphide, carbon monoxide, chlorine, hydrogen cyanide, hydrogen sulphide, nitrous fumes, organic halogen compounds, phosgene and sulphur dioxide.

The apparently high price of the present publication is due to the necessity of producing exact shades of colour on the colour chart which is included.

Death of Dr. A. E. H. Tutton

A Pioneer in the Study of Crystals



Dr. A. E. H. Tutton.

DR. A. E. H. TUTTON, F.R.S., formerly H.M. Inspector of Schools (Technological Branch), Board of Education, died at his home at Dallington, Sussex, on July 14, at the age of 73.

Alfred Edwin Howard Tutton attended evening science classes at the Stockport Mechanics Institute (now the Technical School), and the evening chemistry course of Professor (afterwards Sir Henry) Roscoe at Owen's College, Manchester (now the University). As the result of the May examinations of the Department of Science and Art, South Kensington, in 1883, he was awarded one of the three Royal Exhibitions then annually offered, tenable for three years at the Normal School (afterwards Royal College) of Science and Royal School of Mines, South Kensington (now the Imperial College of Science and Technology), where Sir Edward Frankland was professor of chemistry, and was succeeded two years later by Sir Edward Thorpe.

At the end of his fourth year Tutton was appointed to the staff as assistant demonstrator in chemistry, and in 1889 was promoted full demonstrator, and lecturer on chemical analysis On succeeding Frankland in the chair of chemistry, Thorpe started Tutton on the researches concerning the oxides of phosphorus, for which their joint names became well known, first in the discovery of a new oxide, the tetroxide P_2O_4, and later in the isolation of the lower oxide of phosphorus, P_4O_6 a substance totally different from the expected P_2O_3. It was shown by direct experiment that its vapour, of garliclike odour, was the cause of "phossy jaw" from which the employees in lucifer match works suffered, due to the use of yellow (ordinary) phosphorus in manufacture. Legislation forbidding the use of ordinary phosphorus was passed, and the disease was eliminated.

"Tutton's Salts"

It was in crystallography, however, that Tutton became pre-eminent. After measuring and describing the crystals of a number of new organic substances, including pure aconitine, he began his greatest work, the study of a definitely related series of substances, with the view of discovering the effect, on the crystal form and properties, of the replacement of one chemical element by another. The similarly crystallising sulphates and selenates of the alkali metals potassium, rubidium and caesium, and also of their analogues ammonium and thallium, formed one series; and another consisted of the double sulphates and selenates which the series just mentioned formed with the sulphates and selenates of the metals of the magnesium, iron, and copper groups of eight metals, which crystallise magnificently with six molecules of water, and have since become known as "Tutton's salts." In all, no fewer than 91 salts were studied, the results being published in about 50 papers to the Royal Society and the Chemical Society. The results revealed an important natural law, that the whole of the crystal properties vary regularly with the atomic number (or weight) of the interchangeable elements; for instance, the crystal angles, the dimensions of the unit cells of the lattice-structure, and the optical and thermal constants. The law has since been fully confirmed by the X-ray analysis of the Tutton salts. Tutton's crystal work included the study of the perchlorates and the double chromates, and was only completed according to his original plan in 1929, having occupied over 30 years.

After 1895 Tutton carried out his researches in his own private laboratory, for in that year he left South Kensington on his appointment as H.M. Inspector of Technical Schools, a position he held until his retirement in 1924. While at Oxford he became attached to New College, and took the degrees of B.Sc. (1898), D.Sc. (1903), and M.A. (1905). In 1899 he was elected a Fellow of the Royal Society for his crystallographical researches. While in London he devised and supervised the construction, for the Standards Department of the Board of Trade, of the Tutton interferential comparator, for effecting the official comparisons of the Imperial Standard Yard with its local government and other official copies, by the refined method of the interferometer, the principle of which he had used in his crystal work for the determination of the thermal expansion of crystals. The recorded unit of measurement of this delicate instrument is the one-eight-millionth of an inch. He intended using this instrument to evaluate the Imperial Standard Yard in wave-lengths of the standard radiation of light (the red line of the cadmium spectrum). The result, laid before the Royal Society in 1931 (Tutton's last paper), was that there are 1,420,210 wave-lengths of the red radiation of cadmium in the yard at the official temperature of 62° F. This number was wonderfully confirmed in 1934 by the result, 1,420,209, obtained at the National Physical Laboratory, using the method of Fabry and Perot.

Tutton published four books, of which the most important is his two-volume "Crystallography and Practical Crystal Measurement" (1911). "The Natural History of Crystals" (1924) is a more popular exposition, and "Crystalline Form and Chemical Constitution" (1926) was written for the benefit of students taking the courses of lectures which he gave between 1925 and 1930 at the University of Cambridge. "The Natural History of Ice and Snow, illustrated from the Alps" (1927), was connected with another side of his character as a great lover of the mountains. He lectured on "The Seven Styles of Crystal Architecture" at the Winnipeg meeting of the British Association in 1909, and on "Crystals and Atoms" at Kimberley during the 1929 visit of the association to the Cape.

A NEW ALLOY FOR WIRE GAUZE

Fine wirecloths made of a special metal, which is described as long life Durissimo wire gauze, have been introduced by George Christie, Ltd. This new metal is an alloy of nickel, copper, and other metals, having a silvery appearance, and possessing the strength, toughness and ductility of steel. It is very highly resistant to the action of corrosive agents, such as acids, alkalis, brines, and sulphurous atmospheres, and in these respects is not surpassed by any metal or alloy in commercial use. The new alloy is almost similar in appearance to monel metal, but its properties of strength and resistance to deterioration are claimed to surpass those of monel or pure nickel. The new alloy is being prepared as wire gauze in all meshes from No. 2 down to 200 per lineal inch, or finer.

Ceramic Pigments*

New Colours Derived from the Less Familiar Elements

THE definition of ceramic pigments can be given as inorganic compounds, mixed crystals, solid solutions, colloidal suspensions, and inert oxides, which are stable at elevated temperatures. Other outstanding physical characterestics are permanence to light and, in most cases, acid and alkali resistance. The palette of ceramic colours is rather limited compared with the vast number of organic colours, but research has contributed many new colours, especially in the field of the less familiar elements. This paper will deal with ten of these elements, divided into two groups according to their oxides:—

Group 1.	White Oxides.	Group 2.	Colouring Oxides.
Titanium	Cerium	Vanadium	Uranium
Zirconium	Molybdenum	Selenium	Praseodymium
	Tin		Neodymium

White Oxides

Formerly considered a rare element, titanium is the ninth most prevalent element on earth. Despite its abundance only three minerals are of economic importance—ilmenite in the form of ferrous titanate, and rutile and brookite as titanium dioxide. Industrial application of titania of noteworthy importance started only a few years ago with the production of high-grade material on a commercial scale. Since the price and grade of titania made it acceptable for general use in ceramics, the consumption has increased from year to year. Its physical characteristics (white colour, specific gravity 3.9, refractive index 2.5-2.9) and its acidity at elevated temperatures made numerous new compounds and colours possible. Titania in combination with antimony will increase the acid resistance of enamels when smelted in the frit. While titania as a paint pigment is the most opaque white material known, it is not considered a true opacifier for enamels on account of its solubility.

As a compound of zinc antimony titanate, however, it can be rated equal with the best opacifiers on the market. This new opacifier is a solid solution of zinc antimonate and zinc titanate, in which zinc can be replaced with other electropositive elements such as calcium or barium. When added at 4 per cent. to a commercial enamel, it gives a reflectance of 73 measured on a Hunter reflectometer with magnesium oxide as an arbitrary figure of 100. As a ceramic colour, rutile has been used for colouring pottery glazes and bodies. An specialy clean ivory to dark tan colour can be obtained with a calcined and quick-quenched native rutile. A similar ceramic colour, a light yellow, is produced by mixing and calcining equal parts of rutile and zinc oxide. The most important titania colour, however, is a recently discovered pigment consisting of chromium, antimony, and titania. This strong and inert pigment is rich yellow in colour, and 2 to 3 per cent. are sufficient to obtain a strong yellow coloured pottery body. Analysis of this solid solution of chromium antimonate and titania shows approximately 2 to 5 per cent. chromic oxide, 10 to 20 per cent. antimony pentoxide, and the remainder titania. The additions of electropositive element will strengthen the colour and at the same time will change it to a brownish yellow. This new yellow colour can stand temperatures in body and glazes up to 1,300° C.

Zirconium Opacifiers

In the form of zirconium oxide, zirconium is commercially produced from the common minerals zircon and baddeleyite. When transparent and coloured, zircon is sold as a semi-precious stone, and for the past few years artificial zircon has been produced successfully. Consumption of zirconium as zirconium silicate and oxide has assumed noteworthy importance in the enamel industry. Zirconium oxide is a stable white powder with a specific gravity of 5.75 and a refractive index of 2.2. Zirconium is used successfully in the form of zircon and sodium zirconium silicate in enamel and glaze frits, to produce opacity. As zirconium oxide it is used as a smelt in the frit and more recently as a mill addition opacifier; opacification with zirconium oxide as a mill addition is improved by the following factors:

1. A zinc oxide containing frit should be used.
2. The particle size of zirconia should not be smaller than 0.5 micron.
3. Zirconia should have the proper crystal form.

Zirconium oxide is either monoclinic or tetragonal or a mixture of both, depending on the process of manufacture. A good zirconium opacifier will have at least 75 per cent. tetragonal crystals. The average zirconium opacifier added at 4 per cent. as a mill addition to a commercial frit will give the enamel a reflectance of 71 to 72 on a Hunter reflectometer. Ceramic colours made with zirconium oxide are very few, if any, and are not commercially imported at present. The fact that zirconium oxide is very inert and near neutral at elevated temperatures may be an asset for opacifiers but is obviously a handicap for the development of ceramic colours.

The element tin is widely distributed in the form of tin oxide, but the only ore commercially important is cassiterite (SnO_2), which occurs in a few localities such as Queensland, Bolivia, and the Straits Settlements. The bulk of cassiterite is reduced to tin metal and used for tinning sheet iron and producing various alloys. A relatively small amount is used as tin oxide in ceramics. Of the different grades, the French process tin oxide (oxidised tin powder by means of a very hot flame) is considered one of the best. This type of tin oxide is a fine white powder of tetragonal crystal form with a specific gravity of 6.9 and a refractive index of 2.04. It has been used as an opacifier for many years and has been recognised as one of the most reliable opacifiers on the market. Added at 4 per cent. to the mill of a commercial frit, it produces a reflectance of 73 to 73.5.

Tin Oxide as Main Constituent

Several ceramic colours are made with tin oxide as its main constituent, besides its use as a so-called stabilizer in lead antimonate yellows. Tin oxide mixed and fired with magnesium and cobalt oxides produces a sky blue colour, the so-called Cerulean Blue. This cobalt magnesium stannate is permanent to light, is acid and alkali resistant, and is a highly esteemed artist's pigment. A well-konwn ceramic colour is chrome tin pink, a very stable rose-red to a bluish-red glaze stain. The composition is about 1 per cent. chromic oxide, 3 per cent. silica, and the remainder calcium stannate. The red colour it attributed to colloidally dispersed chromic oxide (Mellor, *Trans. Ceram. Soc.* 1937, *36*, 16-27) and will change to a bluish red with the addition of borax. The purest red is obtained with a high calcium content. This bears some resemblance to colloidal gold solutions, where the colour changes from red to bluish red with the change of pH and is attributed to different sizes of colloidal particles. A similar pigment, although yellow, is vanadium tin yellow which will be mentioned later under vanadium.

Cerium, a prominent member of the rare earths group is now commercially produced from monazite sand. In the form of ceric oxide it is used to a certain extent in ceramics. Its physical properties are: colour, yellow or white; crystal form, cubic; specific gravity, 7.3; and refractive index, 2.19. The use of ceric oxide as an opacifier has not made much headway in America as compared with the continent. The price is still prohibitive, and the production of a good white ceric oxide with high opacifying qualities is not easily accomplished. In order to obtain the white modification, only ceric salts are used for calcination. Cerous salts will yield yellow ceric oxide. Another important factor, which applies to all

* From *Industrial and Engineering Chemistry*, July, 1938.

opacifiers, is that the particle size should not be below 0.5 micron. This can be controlled by a certain method of precipitating ceric hydroxide. Small amounts of impurities left in the precipitate during calcination will further improve the opacifying power of ceric oxide. A good ceric oxide added at 4 per cent. to the mill of a commercial frit will give a reflectance of 75, the highest of all known opacifiers. Ceric oxide plays a minor role in ceramic colours; the only industrially applied colour is ceric titanate, producing a gold-yellow colour in glass. Other cerium colours, which can be used for porcelain decorating, are a blue ceric molybdate and a bluish green ceric tungstate. Ceric oxide as a chemical glass decolouriser or an oxidizing agent for ferrous ions in glass is used successfuly if the presence of arsenic is avoided (*Stransky, teram. Rundschan,* 1937, *45,* 515-6.).

Chief minerals of molybdenum are molybdenite, MoS_2, and wulfenite, $PbMoO_4$. The largest user of molybdenum is the steel industry. Molybdenum and its salts are important reagents. Molybdenum oxide, MoO_3, is grayish white, has a specific gravity of 4.5, and is rhombic. The oxide itself is not an opacifier, but its lead and barium salts are used successfully as opacifiers in low-fired gas enamels, such as lead borate and lead borosilicate. Five to ten per cent. of lead molybdate are sufficient to give a good white opaque glass enamel. Other opacifiers, such as tin or zirconium oxides, are not successfully used in this low-melting glass because 10 to 20 per cent. would be required to equal the opacity of lead molybdate and at the same time the eutectic would be raised too high to render a glossy surface. Lead molybdate's one weakness is its sensitivity to light, which will darken the glass considerably. Lead molybdate fired at higher temperatures will turn quite yellow and can be used as a yellow glaze stain. Lead phosphomolybdate (Shiveley, U.S.P., 2,079, 339) has been claimed to be a good opacifier, and a few blue and green glaze stains (Demyr, *Argile,* 1937, *173,* 7-11) have been mentioned, but industrially only lead molybdate is of any importance at present.

Colouring Oxides

Once regarded as a scarce element, vanadium is now known to be abundant on the earth's crust. Main sources for commercial production are ilmenite and magnetite, uranium ores, and vanadium minerals (vanadinite and chileite). Vanadium is used mainly in the steel industry. In the form of its oxides (V_2O_5 and V_2O_3) and its salts (especially metavanadates) vanadium is gaining more and more ground in ceramics. Vanadium oxides are used to produce a yellow glass. A more recent discovery is a yellow pigment of exceptional stability—vanadium tin yellow. This inert pigment, consisting of 2 to 3 per cent. vanadium pentoxide and tin oxide, is somewhat similar to chrome tin pink, inasmuch as both depend on the colloidal distribution of small amounts of colouring oxides on a tin oxide lake. It is obvious that the quality and strength of the colour will depend much on the best colloidal distribution of vanadium pentoxide and also on the manufacturing process. Two different stains are used: one is a clean opaque yellow, and the other a strong greenish yellow which is more or less transparent and decidedly crystalline. Both yellows can be used as glaze, underglaze, overglaze, and body stains at temperatures up to 1,400° C.

Selenium is widely distributed on the earth but only in small quantities. There are a number of rare selenium ores which are of little importance commercially. One of the main sources is selenium in one of its allotropic forms as a by-product in the sulphuric acid process. Elementary selenium, selenium oxide, and its salts are of utmost importance in ceramics. At present selenium produces the only pure red colour in vitreous enamels, glass enamels, and low-fired glazes. In the form of selenates and selenites, especially as sodium and barium salts, it is used in small percentages for decolourising glass (Weyl, *Glass Ind.* 1937, *18,* 73-8, 93, 117-20, 167-71.), an optical process based on the absorbtion of red and blue light. At higher percentages selenium, in combination with cadmium sulphide, produces a rich ruby coloured glass when reheated or annealed. This ruby glass is made in one firing by the addition of elementary cadmium (Silverman, U.S.P. 1,983,151). With smaller amounts of selenium and cadmium sulphide an amber coloured glass can be produced. It is obvious that, for the development of a strong selenium red in glass, the presence of cadmium sulphide is necessary. The red colour can be made individually by calcining a mixture of cadmium sulphide, cadmium oxide, and elementary selenium at a dull red heat. The resulting product, in which part of the sulphur is replaced by selenium, contains from 5 to 15 per cent. selenium, according to the shade of red desired. This cadmium sulphoselenide is also produced by precipitating a soluble cadmium salt, sodium sulphide, and sodium selenide in the proper proportion. It is used as a paint pigment, especially in the form of a lithopone, which is prepared by carrying out the reaction in the presence of barium sulphide and zinc sulphate; coprecipitated cadmium sulphoselenide, barium sulphate, and zinc sulphide are formed. If cadmium sulphoselenide is used in glass enamels such as lead borosilicate, it is necessary to add about 5 per cent. cadmium oxide or carbonate to the batch to prevent black spots for which lead sulphide is responsible.

Neodymium and Praseodymium

Neodymium and praseodymium were discovered in 1885 by Auer von Welsbach. They occur in all cerium minerals in a ratio of at least 2 parts neodymium to 1 part praseodymium. Pure neodymium salts can be obtained by fractional crystallisation of the double ammonium nitrates. Neodymium oxide or oxalate is used in glass to produce a very delicate violet, which shows up bluish in the thinner parts of the glass and reddish in the heavier parts and thus exhibits a unique colour effect (Loeffler, *Glashütte,* 1936, *66,* 63-5). Praseodymium used the same way will give the glass a fine greenish yellow tint. If and when a better and cheaper way of producing or separating these two rare earth elements is found, the ceramic industry will undoubtedly take advantage of it. The price for praseodymium, which is very hard to separate completely from neodymium, is too high to be considered. Neodymium, of a greater staining power than praseodymium, does not have to be completely pure and is used for that reason to a certain extent in the glass industry. Recently neodymium has been tried and successfuly applied as a physical decolouriser for glass. This is not surprising, since it is almost an exact complementary colour of the blue-green iron colour in glass, and is so bright and pure that it cuts down the addition of a gray in the glass to a minimum.

Uranium Lustres

The last and heaviest element in the periodic table, uranium, is found in the form of its oxides, $UO_3.UO_2$, in the mineral pitchblende and as $K_2O.2UO_3$, $V_2O_5.2H_2O$ in carnotite. It is more or less a by-product in the manufacture of radium. Despite its relativey high price, uranium in the form of sodium uranate, uranate oxide (U_3O_8), and uranium hydroxide is used quite extensively in ceramics. A prepared yellow stain of sodium uranate, alumina, and silica is employed in high-fire ivory and yellow glazes, the colour depending on the amount of yellow used. If sodium uranate is added at 15-20 per cent. to a low-fired lead glaze, a brilliant tomato-red glaze is produced. Uranium also plays an important part as a so-called lustre. "Lustres" as used here mean compounds or soaps of metal oxides and resin acids, which, when applied to glazed pottery, impart an iridescent colour effect to the surface. Uranium lustre is of a greenish yellow iridescence. Glass stained with uranium oxide has a unique colour display; it shows a wine yellow colour in transmitted light and a greenish yellow fluorescence in reflected light.

TUNGSTEN WIRE FOR ELECTRIC LAMPS is to be manufactured at Vicenza by the Industrie Vicentine Elettro-meccaniche S.A.

Mr. John Benn

Prospective National Conservative Candidate for North Bradford

MR. John Benn has accepted an invitation to become prospective National Conservative candidate for North Bradford at the General Election, in succession to Sir Eugene Ramsden, who will not seek re-election.

Mr. Benn, who is thirty-four years of age, is the eldest son of Sir Ernest Benn and a director of Benn Brothers, Ltd., the proprietors of THE CHEMICAL AGE. In entering politics, he is following a distinguished family tradition. If he is successful in his Yorkshire campaign, three generations of his family will have sat in the House of Commons. His grandfather, Sir John Benn, graduated in public affairs on the London County Council and sat in Parliament for Devonport for many years. His father's younger brother, Mr. Wedgwood Benn, has been in the thick of the Parliamentary struggle for over thirty years; he was Secretary of State for India from 1929 to 1931 and now represents the Gorton Division of Manchester. His father has written widely on economic and political subjects, but has never sought election to Parliament. By concentrating his energies on his publishing business, he has made the path of public service easier to others.

Mr. John Benn was educated at Harrow, Cambridge, and Princeton, U.S.A. He joined Benn Brothers in 1925, and his experience in journalism has included the editorship of *Discovery* and *The British Trade Journal* and the initiation of *Industria Britanica,* a journal in Spanish to afford propaganda for British industry in South America. In two books, "A Merchant Adventurer in South America" and "Tradesman's Entrance," he has recorded his experiences as a commercial traveller for the trade and technical journals published by his firm. In the past two years he has made a first-hand study of the Special Areas and has recently been instrumental in introducing a new industry to South West Durham. In 1929, he married Ursula, daughter of Sir Maurice Hankey, Clerk to the Privy Council and Secretary to the Cabinet.

The Distillers Co., Ltd.

Industrial Alcohol and Chemical Production

COSTS of distilling have risen, and the profits on the manufacture of spirits have consequently fallen, but trade at home showed to appreciable advantage during the year, said Lord Forteviot, chairman of the Distillers' Co., Ltd., in his speech at the annual meeting on July 15.

Business in industrial alcohol has progressed favourably during the year, but, in this case, the company is working on very narrow margins of profit, and the costs of manufacture have also been affected by the coal and labour charges. The extra cost of coal used by various units was considerable when compared with the previous year, and the company has been compelled to exercise economies in this direction, in order that they may be able to maintain the minimum cost of production.

The chemical side of the business has progressed during the year, but has suffered somewhat from exceptional competition from abroad where considerations of profit, or even costs of production, do not at the moment seem to enter into the quoted price. The yeast and malt extract business has been satisfactory, but profits have decreased owing to increased costs of raw materials, wages, coal and labour.

Reference was made last year to the Gyproc plaster board factory, which was then in the course of erection at Shieldhall, Glasgow. This has now been completed, and is fully occupied in the manufacture of plaster boards and other products for the building industry. These products have met with a very favourable demand, and arrangements have been made for an increase in the manufacturing capacity of this factory and of the works at Rochester.

The Kestner Vibro-Mixer

A New Shaker for Liquid Mixing and Sieve Testing

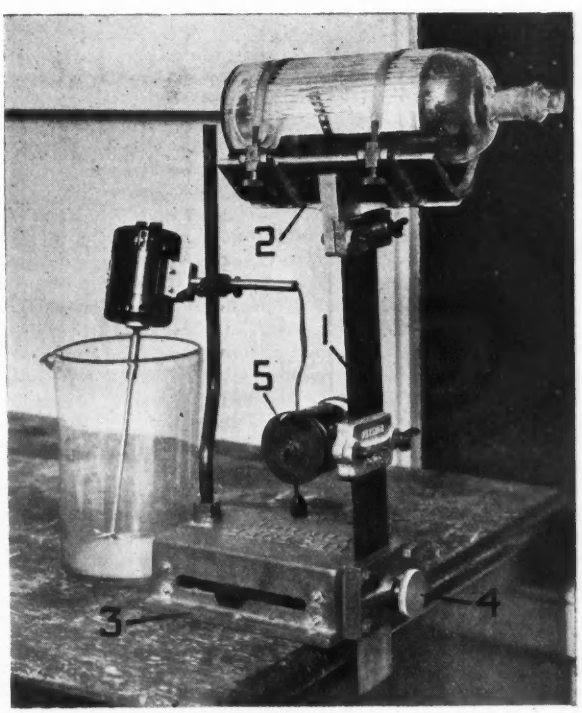
THE Kestner Evaporator and Engineering Co., Ltd., have recently brought on to the market the Kestner Vibro-Mixer, which can not only be used as a liquid mixer, but also as a sieve tester.

As the illustration shows, the standard model comprises a solid cast iron base plate (3), to which is attached a spring blade (1). The length of this blade can be varied by sliding it up and down, and locking into the required position by the locking wheel (4). Mounted at the top of the blade is an aluminium oil cradle (2). This cradle is designed to carry bottles from 3 in. to 8 in. diameter by 4 in. to 12 in. long. The bottle is fixed in the cradle by means of two easily adjusted locking straps. The liquid or solid mixtures to be agitated are placed in a bottle, and the bottle secured to the cradle (2). A fractional H.P. motor (5), provided with out-of-balance gear, is fixed to the blade, and when the motor is started up a rocking motion takes place. A variable speed control is used within the base plate (3), and by altering the speed of the motor and the length of the blade, an extremely wide range of vibrations can be produced. The unit can be operated from any normal electric current supply in a.c. or d.c.

A Precaution for Inflammable Fumes

When sieving tests are required a nest of sieves is fitted to the cradle (2) by a simple locking device. The Vibro-Mixer is also available with a laboratory stirrer attachment, and this is shown in the photograph. The speed control for the stirrer is also used in the base plate (3), forming a compact and multi-purpose unit.

The Kestner laboratory stirrer is now supplied with a flexible shaft, so that the motor can be kept well away from the vessel being stirred, when corrosive or inflammable fumes are being evolved. A recent addition to the standard equipment of the laboratory stirrer is an electrically operated hot plate, provided with heat controlled switch, on which the vessel to be stirred can stand.



Side view of the Kestner Vibro-Mixer with laboratory stirrer.

British Overseas Chemical Trade in June

ACCORDING to the Board of Trade returns for the month ended June 30, 1938, imports of chemicals, drugs, dyes and colours were valued at £903,611, as compared with £1,099,839 for June, 1937, a decrease of £196,228. Exports were valued at £1,715,994 as compared with £2,307,385, a decrease of £591,391. Re-exports were valued at £41,495.

Imports

	Quantities June, 30. 1937.	Quantities June, 30. 1938.	Values. June 30. 1937 £	Values. June 30. 1938. £
Acids—				
Acetic .. .. cwt.	11,769	8,322	13,161	9,987
Boric (boracic) ,,	9,600	2,317	10,737	2,752
Citric .. .. ,,	1,831	1,645	7,738	6,683
Tartaric .. ,,	2,620	2,745	11,068	12,712
All other sorts value	—	—	6,456	5,129
Borax .. .. cwt.	45,460	2,656	28,538	1,800
Calcium carbide .. .	69,442	132,145	38,138	60,627
Fertilisers, manufactured—				
Superphosphate of lime tons	1,263	1,038	4,242	3,707
All other descriptions ,,	2,343	936	15,143	5,574
Potassium compounds—				
Caustic and lyes cwt.	13,168	13,254	14,944	14,433
Chloride (muriate) ,,	36,350	77,782	13,829	28,835
Kainite and other potassium fertiliser salts cwt.	11,200	5,640	2,030	568
Nitrate (saltpetre) ,,	10,304	2,086	7,433	2,009
Sulphate .. ,,	54,882	13,000	13,275	6,099
All other compounds ,,	10,747	7,663	14,550	9,835
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	272	1,297	127	556
Chromate and bichromate .. cwt.	1,547	2,215	1,827	2,465
Cyanide .. ,,	1,482	2,118	3,566	4,941
Nitrate .. .. ,,	94,898	27,453	20,392	6,888
All other compounds ,,	28,109	15,070	19,632	11,971
Other chemical manufactures .. .. value	—	—	347,547	300,913

	Quantities. June 30. 1937.	Quantities. June 30. 1938.	Values. June 30. 1937. £	Values. June 30. 1938. £
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	107,876	199,340	9,843	16,052
Medicinal oils .. cwt.	1,048	2,084	2,975	4,824
Proprietary medicines value	—	—	57,766	63,893
All other sorts ,,	—	—	44,495	41,211
Finished dye-stuffs obtained from coal tar cwt.	5,138	3,243	148,433	102,134
Extracts for dyeing ,,	3,489	2,318	6,412	5,515
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	38,022	32,057	26,283	25,099
Quebracho .. ,,	10,197	14,708	9,236	13,505
All other sorts .. ,,	28,948	20,896	21,359	17,494
All other dyes and dye-stuffs .. .. cwt.	1,217	284	23,776	4,714
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	4,732	8,004	7,514	11,319
Lithopone .. ,,	25,991	27,322	16,117	16,502
Ochres and earth colours cwts.	39,300	24,636	12,685	8,474
Bronze powders and other metallic pigments cwt.	2,182	985	16,042	7,246
Carbon blacks .. ,,	41,430	23,914	59,827	31,350
Other pigments and extenders, dry cwt.	41,874	62,417	11,611	12,311
All other descriptions ,,	17,987	11,563	31,092	23,484
Total .. .. value	—	—	1,099,839	903,611

Exports

	Quantities June, 30. 1937.	Quantities June, 30. 1938.	Values. June 30. 1937 £	Values. June 30. 1938. £
Acids—				
Citric .. .. cwt.	2,835	1,644	13,199	7,600
All other sorts .. value	—	—	27,081	25,654
Aluminium compounds tons	2,902	2,515	32,668	25,922
Ammonium compounds—				
Sulphate .. tons	43,204	19,223	260,944	125,165
All other sorts .. ,,	1,517	1,151	17,596	17,536
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	62,143	44,290	16,288	13,894
All other sorts .. ,,	7,783	3,810	18,702	11,160
Coal tar products—				
Cresylic acid .. galls.	229,814	147,987	40,909	22,787
Tar oil, creosote oil ,,	3,140,413	2,858,207	82,962	71,028
All other sorts .. value	—	—	24,986	13,982
Copper, sulphate of tons	4,059	6,338	83,714	93,964
Disinfectants, insecticides, etc. .. .. cwt.	36,541	20,368	71,616	47,743
Fertilisers, manufactured tons	22,696	4,757	56,496	35,636
Glycerine .. .. cwt.	11,246	11,560	49,501	47,806
Lead compounds .. ,,	14,689	12,511	26,386	17,431
Magnesium compounds tons	546	384	12,598	9,395
Potassium compounds, cwt.	6,063	3,905	11,957	7,578
Salt (sodium chloride) tons	23,877	16,829	63,725	44,694
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	468,651	285,658	103,447	65,721
Caustic .. .. ,,	279,705	175,872	112,943	93,688
Nitrate .. .. ,,	730	741	374	303
Sulphate, including saltcake .. cwt.	107,055	67,679	10,694	8,516
All other sorts .. ,,	76,654	72,134	78,778	82,222
Chemical manufactures and products .. value	—	—	21,996	23,423
Drugs, medicines and medicinal preparations cwt.	—	—	11,409	14,225

	Quantities. June 30. 1937.	Quantities. June 30. 1938.	Values. June 30. 1937. £	Values. June 30. 1938. £
Zinc oxide .. tons	1,063	1,079	26,732	19,873
All other descriptions value	—	—	252,751	184,141
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts oz.	97,808	64,987	11,002	8,000
Proprietary medicines value	—	—	119,140	93,048
All other descriptions value	—	—	152,038	127,204
Dyes and dye-stuffs and extracts for tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,689	317	9,342	3,538
Other sorts .. ,,	8,538	4,679	113,253	74,751
Extracts for tanning (solid or liquid) cwt.	24,532	10,580	21,106	9,466
All other descriptions ,,	2,234	1,558	11,517	7,102
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	15,450	9,125	14,152	11,174
Other descriptions ,,	25,725	20,871	40,857	36,659
White lead .. ,,	4,396	4,341	10,374	8,803
Ships' bottom compositions cwt.	4,279	3,448	14,467	10,779
Paints and painters' enamels .. .. cwt.	45,834	37,057	132,156	109,784
Varnish and lacquer (clear) .. galls.	95,523	66,985	37,161	26,622
Printers' ink .. cwt.	4,561	4,239	25,937	20,565
All other descriptions ,,	50,256	37,365	97,836	75,060
Total .. .. value	—	—	2,307,385	1,715,994

Re-Exports

	Quantities. June 30. 1937.	Quantities. June 30. 1938.	Values. June 30. 1937. £	Values. June 30. 1938. £
Dyes and dye-stuffs and extracts for tanning, cwt.	830	163	1,778	2,039
Painters' and printers' colours and materials cwt.	615	1,062	959	1,808
Total .. .. value	—	—	36,142	41,495

New Technical Books

AN INTRODUCTION TO CHEMISTRY. By John Arrend Timm. Third edition. Pp. 568. McGraw-Hill Publishing Co., Ltd., 21s.

In this text, which was written for use at Yale in 1926, and since then revised several times, it has been the object of the author to develop an appreciation of the scientific procedure as it has been applied in the derivation and testing of the fundamental theories of the physical sciences, that is, of the way in which data are collected and classified, of the process of analysis or reduction to simpler terms, of the setting, testing, and modification of one hypothesis after another until, finally, a general formula or law of nature is discovered. It has also been his endeavour to teach how the results of research are published, abstracted, tabulated, and finally brought together in the form of scientific monographs, and how to use this literature for the acquisition of scientific information; to give a knowledge of the application of these theories to the development of natural resources, to the problems of industry, and to those of daily life of the individual; to treat the development of the theory from an historical point of view as far as is consistent. On the occasion of the last revision it seemed to the author that the time had not yet arrived for the introduction of the generalised definitions of acids and of bases into the text of an elementary chemistry, but he is no longer of that opinion. Their use makes possible the correlation of the theories of atomic structure and of the nature of valence with the behaviour of solutions of electrolytes. Accordingly the material in the chapters on atomic structure, the theory of electrolytic dissociation, and the reactions of electrolytes, has now been completely rewritten and rearranged. The classical definitions of acids and of bases, which are still widely used, have been given first and the more general ones of Brönsted have been developed from them. A new chapter on nuclear chemistry has been added, because the popular interest in transmutation, or "atom-smashing," makes this addition desirable.

ORGANIC CHEMISTRY: an Advanced Treatise, Henry Gilman, Students. By Frederick Prescott and Dudley Ridge. Pp. 688. London: University Tutorial Press, Ltd. 8s. 6d.

This book covers the organic chemistry which is required by second year medical students and by students reading for a general B.Sc. degree. In order to meet the needs of the medical students the chapters dealing with the carbohydrates, purines, proteins and fermentation are treated more fully than is usual in most textbooks of organic chemistry. A number of paragraphs are presented in smaller type, in order that they may be omitted at a first reading. Practical details of preparations and estimations have not been included, because they may be readily obtained from one of the standard practical manuals on the subject. A number of tests for organic substances, however, have been included in small type. Each chapter is accompanied by a series of examination questions reprinted by permission of the University of London and the Institute of Chemistry, and there is a very full index of 32 pages.

ORGANIC CHEMISTRY: an Advanced Treatise. Editor-in-chief, Henry Gilman. Pp. 1890. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 2 vols., 37s. 6d. each.

This is a general treatise of organic chemistry suitable for instruction at the graduate level, written by 27 sectional contributors. As such it focuses attention upon new developments. The idea of a collaborative work by specialists in the several branches of the science was developed in 1934. Each author was asked to prepare a chapter dealing with a subject of particular interest to himself. In this way, it was hoped to obtain an authoritative treatise which would cover most of the important phases of organic chemistry. For the sake of convenience, the rapidly developing fields of natural products, relationship between physical properties and chemical constitution, valence, and resonance, have been grouped together in the second volume. It is planned to revise both volumes at intervals, not only in order to bring the present material up to date, but also to permit the inclusion of new chapters to fill the more conspicuous gaps. For example, chapters on polymerisation and chlorophyll will be included in the next edition. The contents have been integrated and the accessibility of the information has been increased by cross references, and by individual tables of contents for each chapter. There is a comprehensive subject index which is repeated in each of the two volumes—a very useful feature which is desirable in many works extending to two or more volumes. The inordinate wealth of the literature has made it necessary to restrict references to a relatively few selected original articles. Occasional chapters, particularly those in the field of natural products, have abundant citations to original articles, and should be especially useful to research workers. The general references given at the end of each chapter includes mention of some of the more important review articles and books as a guide to collateral reading, and in some chapters the literature has been reviewed up to September, 1937.

BRITISH CHEMICAL INDUSTRY: its Rise and Development. By Sir Gilbert T. Morgan and David Doig Pratt. Pp. 387. London: Edward Arnold and Co. 21s.

This volume incorporates the substances of a series of public lectures which were delivered at the University College of Wales, Aberystwyth, during the session 1935-6. The authors point out that the task of surveying the rise of British chemical industry from its early beginnings to the present stage of development is difficult in any treatise of modest size, and they are only too conscious of inadequate reference to certain manufacturers and of complete omission in regard to others. That such shortcomings are inevitable will be realised on considering what may be included under the heading of chemical industry taken in its widest sense, for there are not only the exceedingly varied trades in heavy and fine chemicals, but also vast undertakings dealing with food and drink, with clothing and with building materials. In arranging this summary they have grouped, so far as possible, each chemical manufacture with the naturally occurring raw material on which the trade depends. This setting at once suggests certain fundamental differences in regard to the origin and development of various industries. Some, for instance, are based on raw materials found at home, such as salt, coal and limestone; in others the starting-point is some commodity imported from abroad, as in the case of industries based on cellulose, and on oils, fats and waxes. The trend towards economic self-sufficiency has become increasingly marked in recent years and is noticeable more or less among all industrialised nations. Even Great Britain, which was for so long the world's market for the free exchange of commodities is not exempt from this tendency. Investigations are now on foot to diminish imports of sulphur minerals for sulphuric acid manufacture, and of fermentable molasses for the production of industrial alcohol and its numerous derivatives. The problem of obtaining oil from coal is essentially an endeavour to replace a sea-borne liquid fuel by an indigenous one. But even when these and other similar schemes of economic nationalism have materialised there will still remain arts and manufactures for which the basic raw materials can only be obtained from overseas. The authors have endeavoured to explain in simple language the factors underlying the origin and development of the principal chemical industries which contribute to the national welfare in a manner that is not always fully appreciated. Illustrations are a notable feature of the book, there being 56 photographs (presented on 33 plates) and 79 figures in the text.

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Personal Notes

The late MR. JOSEPH MEIR, of Wolstanton, Staffs, colour manufacturer, left £5,620, with net personalty £5,527.

THE LATE MR. DENNIS TOPHAM MOSS, of William Moss and Sons (Ripon), Ltd., varnish manufacturers, who died on May 17, aged 87 years, left £100,740, with net personalty £90,366.

MR. CLARENCE A. SEYLER, B.Sc., F.I.C., the West Wales analyst and expert on the microstructure and chemical composition of coal, has received the degree of D.Sc. *honois causa*, from the University of Wales.

The late COLONEL FRANCIS TORRIANO FISHER, of Sevenoaks, late superintendant of the Royal Gunpowder Factory, Waltham Abbey, and the Royal Small Arms Factory, Enfield Lock, left £11,192, with net personalty £9,698.

MR. ARTHUR STEPHEN DENNIS BARRETT, of Linthorpe Road, Middlesbrough, has been awarded a Robert. Blair Fellowship by the L.C.C. Mr. Barrett, who is 31, is a process engineer at Billingham, Co. Durham, and proposes to study chemical engineering in the United States or Germany. The fellowship carries a grant of £450.

MR. W. T. GRIFFITHS, for the last ten years manager of the research and development department of the Mond Nickel Co., has had the degree of D.Sc. conferred upon him by the University of Wales. Mr. Griffiths was responsible for designing and equipping the Mond Nickel Co.'s research laboratory in Birmingham, which was opened in October, 1936.

DR. EMIL KIRDORF, at one time the most powerful industrialist in Germany, has died at Essen at the age of 91. He was responsible for the establishment in 1893 of the Rhenish-Westphalian Syndicate, which consisted of 98 out of the 102 mineowners on the Ruhr. Under Kirdorf's direction the output was increased in the next 20 years from 35,000,000 to 100,000,000 tons per year.

MR. JOHN ROUT, of Norwich, who carried on business as a baking-powder manufacturer, left gross estate to the value of £119,171, with net personalty £75,289.

MAJOR CHARLES GEORGE LYON, vice-chairman of Yorkshire Tar Distillers, Ltd., and a director of National Benzole, Ltd., and other companies, left estate valued at £52,294 (net personalty £33,834).

DR. C. H. CLARKE'S appointment to the board of directors of Lever Brothers and Unilever, Ltd., as briefly announced in last week's issue, follows a long career in the technical field of the soap industry. After graduating in the universities of London and Bristol, and studying in Zurich and Berlin, he joined Joseph Crosfield and Sons, Ltd., as a research chemist in 1913. Following service in the war he resumed his post at Warrington in 1919. Three years later he became manager of the Research Department at Port Sunlight, and in 1925 became general works manager. In 1931 he came to London as technical advisor to the Home Soap Executive, and he was made a member of that executive at Unilever House in 1934.

OBITUARY

MR. EDWIN HENRY GRIFFITHS, of Sketty, Swansea, Nobel's explosives agent in West Wales for 26 years, died last week in his 66th year.

MR. COURTENAY C. S. FOOKS, of Brick Court, Temple, E.C., and Horton Kirby, Dartford, Kent, a director of the Gas Light and Coke Company, has died in a London nursing home at the age of 78.

MR. ARTHUR BROCK, the veteran governing director of C. T. Brock and Co., fireworks manufacturer, has died at Chesham Bois at the age of 80. He had been head of the firm—which was established well over two centuries ago—since his elder brother died in 1881.

Chemical Notes from Foreign Sources

Spain

THE SNIA VISCOSA is reported to have purchased an old paper mill near Alendia, Mallorca, where rayon will be produced from reeds as raw material.

Latvia

THE TAUKVIELA CO., formed jointly by the Turiba Co-operative Association and some private raw material producers, will shortly commence production of fats for soap making, and later also of glycerine, stearin and olein.

Switzerland

F. HOFFMAN-LA ROCHE AND CO., A.G., of Basle, realilsed an increased net profit of 3.17 million francs in 1937 (previous result 2.56 million) and is distributing a dividend of 40 (35) francs per share.

Czechoslovakia

THE SMOLENICE CHEMICAL WORKS (Slovakia) are being taken over by the Czechoslovakian Nitrogen Works, of Marienberg, who intend to increase the output of wood distillation products.

Poland

MANDELIC ACID AND ITS SALTS are now being produced by the Boryszew Co.

ESTABLISHMENT OF A FACTORY FOR OXYGEN, acetylene and other industrial gases, is contemplated by the "Perum" Co., a subsidiary of the S.A. Francaise Peroune, of Paris.

Italy

PLANT FOR THE MANUFACTURE OF A PESTICIDE, on the basis of copper oxychloride, is to be built at Marano Veneto and Pescia by F.M.C.G. Fratelli Marchi of Florence.

A SYNTHETIC RUBBER PLANT, with a daily production capacity of 500 kg., is to be erected at Milan-Bioocca by the Soc. Italiana per la Produzione della Gomma Sintetica, of Milan.

Ten Years Back

From "The Chemical Age," July 21, 1928

The well-known French chemical companies Société Chimiques des Usines du Rhône and Establissements Poulenc Frères have now been united. The new company is known as Société des Usines Chimiques Rhône-Poulenc, and has a capital of 36,000,000 francs.

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A further expension of the subsidiary activities of Imperial Chemical Industries is indicated in the offer by the directors to acquire the share capital of the Welsbach Light Co., the well-known manufacturers of gas mantles and electric and oil heating appliances.

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Boot's Pure Drug Co., Ltd., are about to embark on an extensive scheme of development at Beeston, Notts. Some time ago they acquired 200 acres of land there and on this a new soap factory is to be built, in addition to new roads and railway sidings to deal with the output.

From Week to Week

COURTAULDS, LTD., who employ 700 operatives at the Brook Mill and another 700 at the Bedford New Mill, Leigh, Lancashire, have been forced, owing to declining trade, to close these mills.

SUBSIDIES TO BRITISH INDUSTRIES, since October 1, 1931, according to Sir John Simon, in the House of Commons last week, included beet sugar, £21,164,399, and land fertility improvement, £1,889,205.

GOOD PROGRESS IS BEING MADE at the Redbourne steelworks of Richard Thomas and Co., Scunthorpe, Lincolnshire, with the extending of the melting shop and finishing mill. Of the 82 coke-ovens to be built, 41 have been completed, and are officially lit. The by-product plant to handle the extra gas made at the ovens has also been completed.

IMPERIAL CHEMICAL INDUSTRIES, LTD., have published a new booklet dealing with the methods of using the Shirlan anti-mildew agents. Shirlan is an extremely effective mildew antiseptic and has no harmful effect upon cloth in any circumstances. It is being used successfully to prevent mildew in woollen fabrics and, in conjunction with Waxol W, for tent cloths as well as for cottons.

A NEW PATENT OIL CONTAINER of spheroid form is to be manufactured under patent rights which are being acquired by the Motherwell Bridge and Iron Co., Ltd., Motherwell. It is claimed that this globular tank will eliminate surface evaporation and cut out heavy losses in storage. The original patents are held by the Chicago Bridge and Iron Co., and are being taken over by the Motherwell firm in conjunction with the Whessoe Foundry and Engineering Co., Ltd., Darlington.

THE GOVERNMENT OF THE UNITED KINGDOM will participate officially in the New Zealand Centennial Exhibition, to be held at Wellington from November, 1939, to April, 1940. The year 1940 will mark the completion of one hundred years of British Sovereignty and organised settlement in New Zealand, and the general theme of the exhibition will be the growth and development of the Dominion and the progress of industry, science and art throughout the world during the century.

THE MANCHESTER CORPORATION GAS DEPARTMENT in their annual report make comment on the sale of by-products from gas production. Income from tar, etc., shows a slight increase of £750 as compared with the previous year, but owing to the international situation, "the outlook is decidedly unfavourable." There was a loss of £899 on the sale of sulphate of ammonia. The recovery of benzole and solvent naphtha continues to be satisfactory, and there has been a slight increase of income from this source.

DREADNOUGHT GLASS PIPE-LINES with the Towers tube connector (Prov. Pat. 26456) are described in a new leaflet issued by J. W. Towers & Co., Ltd. Glass is superior to all other materials for pipe-lines where purity of product is of importance or where very corrosive liquids or gases have to be conveyed. Dreadnought borosilicate glass tubing is unsurpassed for this purpose as it is non-brittle, mechanically strong, of high chemical resistance and will withstand sudden temperature changes. It can be supplied in sizes up to 2 inches bore, in straight lengths, right angle or U-bends, T- or Y-pieces.

STANDARD SPECIFICATIONS FOR PROTECTIVE CLOTHING, respirators, gloves and other articles of personal safety equipment may result from a meeting called recently at the request of the National Safety First Association and the Associated Slate Quarries. A resolution was carried asking the General Council of the British Standards Institution to set up a representative Industry Committee to deal with all personal safety equipment. There are already B.S.I. committees dealing with individual articles of safety equipment, such as boots and goggles. The proposed Industry Committee would take over control of these committees and would also deal with any future requests for the standardisation of personal safety equipment.

OPERATIONS AT UNFENCED MACHINERY are the subject of Statutory Rules and Orders, 1938, No. 641. This order affects all processes in the manufacture of beet sugar subsequent to beet washing and precedent to pulp drying; the making of viscose in the manufacture of cellophane paper and the casting and coating processes in such manufacture; all processes in the manufacture of sodium carbonate by the ammonia soda or Solvay process; all processes in the manufacture of caustic soda by the ammonia soda or Solvay process or by continuous causticising process up to, but not including, concentration in caustic pots; the filtering process in the manufacture of sulphate of ammonia; the phosphate reaction pumping process in the manufacture of concentrated fertiliser; the electrolytic process for the manufacture of metallic sodium as regards the operation of dredging the sodium cells, and for the manufacture of caustic soda; any manufacturing process in which a mixture of nitric and sulphuric acids is employed and where risk of fire or explosion would arise if the transmission machinery were stopped; and the reducing volatilising and decomposing processes in the production of nickel.

IMPERIAL CHEMICAL INDUSTRIES, LTD., announced on Wednesday that the company had decided to embark at once upon a major scheme of development in the light metal alloy industry. Extensive new equipment will be installed at the company's works near Birmingham.

STATUTORY RULES AND ORDERS, 1938, No. 642, states that the date of coming into operation of the requirements contained in subsection (2) of section 13 of the Factories Act, 1937, will be postponed until January 1, 1940, as respects factories in which the main transmission machinery is driven wholly or partly by water power.

THE OUTPUT OF MARGARINE in the United Kingdom declined during June, but the average deliveries during the five weeks ended July 2 were 15 per cent. above the average for the same firms in the five weeks to July 3, 1937. Average weekly invoiced deliveries for the five weeks ended July 2 were 3,965 tons, against 4,162 tons in the four weeks ended May 28 and 3,345 tons for the five weeks ended July 3, 1937.

THE CORPORATION OF THE CITY OF LONDON has granted a sum of £5,000, to be paid in five annual grants of £1,000, for the rebuilding and re-equipment of Queen Mary College, University of London. This is the first time a grant from this source has been made to the College, which serves the growing population of London's eastern suburbs, and which is now being modernised at a total estimated cost of £200,000.

IN THE COURSE OF HIS SPEECH AT THE 3RD ANNUAL GENERAL MEETING of North Eastern Trading Estates, Ltd., at Newcastle on Tuesday, Col. K. C. Appleyard, the chairman, announced that they had just secured the hundredth factory for the properties administered by the company. The honour of hitting the last run of the century fell to Thomas Hedley and Co., Ltd., soap and toilet manufacturers, who have decided that Team Valley Trading Estate offers many advantages of situation and amenity for carrying on a new factory.

DECISIONS OF THE INTERNATIONAL SUGAR COUNCIL, which met in London between July 5 and July 16, have been announced. The Council estimated the free market requirements for the first quota year, ending August 31, 1938, to be filled by the countries party to the International Sugar Agreement at 3,038,000 metric tons, but decided that in the absence of official figures 100,000 metric tons should also be taken into account as an estimate of the United Kingdom Government's purchases of reserve stocks. It was decided that 47,000 metric tons of this additional amount should be supplied by the British Colonial Empire.

THE GUIDE TO CURRENT OFFICIAL STATISTICS, now in its 16th volume, provides a ready means of ascertaining the nature of the information available on any subject and the official publication in which it is contained. The Guide contains 406 pages, and is obtainable from the Stationery Office, price 1s., or by post 1s. 5d. It is pointed out that one of the major activities of the Stationery Office is the publication of official statistics dealing with a very wide range of topics. The number of volumes containing these figures runs into several hundreds every year, and the tracking down of the material available on any particular subject would be no easy matter if there were not in existence a systematic index covering the whole field of published official statistics.

Company News

Blythe Colour Works, Ltd., announce an interim of 5 per cent., actual, less tax (same), on the ordinary shares, payable July 29.

Central Oil Mining and Chemicals Trust, in their report for two years ended April 30, show a debit of £631, which, added to £7,420 brought forward, leaves debit of £8,050 forward.

Sanitas Trust, Ltd., has increased its nominal capital by the addition of £49,000 beyond the registered capital of £544,000. The additional capital is divided into 980,000 ordinary shares of 1s. each.

Bayer Products, Ltd., has increased its nominal capital by the addition of £30,000, in £1 ordinary shares, beyond the registered capital of £50,000. At May 11, 1938, Albert H. Diebold, of New York, held 24,997 shares, and F. A. S. Gwatkin, of 31-4 Basinghall Street, E.C.2, held 25,001 shares out of 50,000 issued.

Imperial Chemical Industries of Australia and New Zealand announce that the issue in Australia of 1,000,000 5 per cent. cumulative preference shares of £1, at par, has been oversubscribed by some 200,000 shares. The company is controlled by the Imperial Chemical Industries, Ltd. Prior to the present issue the paid up capital of the company was £3,732,569, having been increased from £2,065,238 on September 30, 1929. The present issue will raise the paid up capital to £4,732,569.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MANUFACTURE OF BRICKS, ETC., and extraction of oil from same. H. V. Allen. 20227.

MANUFACTURE OF CONDENSATION PRODUCTS.—N. Bennett, A. E. Grant, and Imperial Chemical Industries, Ltd. 20207.

HARDENING, ETC., OF ARTICLES OF METALS, ETC.—B. Berghaus. (Germany, July 9, '37.) 20547.

WORKING UP COPPER from spinning, etc., water in the working of cuprammonium cellulose solution.—British Bemberg, Ltd. (Germany, Sept. 9, '37.) 20605.

CONCENTRATION OF ALIPHATIC ACIDS.—British Celanese, Ltd. United States, July 13, '37.) 20120.

RESINOUS COMPOSITIONS, ETC.—British Thomson-Houston Co., Ltd. (United States, July 10, '37.) 20174.

METHOD OF PRODUCING A STABILISED DIAZO COMPOUND.—Calco Chemical Co., Inc. (United States, July 12, '37.) 20132.

PROCESS OF COLOURING MATERIAL, ETC.—Calco Chemical Co., Inc. (United States, July 12, '37.) 20133.

CARBOXYLATION OF ALKALI METAL SALTS OF PHENOLS.—Calco Chemical Co., Inc. (United States, July 31, '37.) 20654.

MANUFACTURE OF IRON, ETC.—W. J. Campbell, A. H. Chiverton, and H. N. Gardiner. 20438.

MANUFACTURE OF SOAP.—C. Cividanes. 20763.

COATING SURFACES WITH CELLULOSE DERIVATIVE LACQUERS.—Commercial Solvents Corporation. (United States, Aug. 16, '37.) 20624.

TREATMENT OF ZEIN.—Corn Products Refining Co. (United States, Aug. 23, '37.) 20195; (United States, April 18.) 20196.

TREATMENT OF MATERIALS containing tantalum, etc.—F. Cuvelliez, and Soc. Generale Metallurgique de Hoboken. 20249.

COATING COMPOSITIONS.—E. I. du Pont de Nemours and Co. (United States, July 17, '37.) 20328.

COATING COMPOSITIONS producing dull surface.—E. I. du Pont de Nemours and Co. (United States, July 22, '37.) 20329.

POLYMERISATION OF UNSATURATED ALIPHATIC HYDROCARBONS.—E. I. du Pont de Nemours and Co. (United States, July 13, '37.) 20795.

MANUFACTURE OF ORGANIC COMPOUNDS.—G. H. Ellis, and H. C. Olpin. 20777.

METHOD OF PRODUCING ALKYL COMPOUNDS OF LEAD.—Ethyl Gasoline Corporation. (United States, Feb. 16.) 20395.

MANUFACTURE OF METHYL, ETC., LEAD COMPOUNDS.—Ethyl Gasoline Corporation. (United States, Feb. 16.) 20396.

UREA-FORMALDEHYDE MOULDING POWDERS.—J. Ferguson and Sons, Ltd., J. E. Ferguson, and S. A. Ede. 20392.

MANUFACTURE OF ACTIVE CARBONACEOUS PRODUCTS.—J. G. Fife (Naamlooze Vennootschap Octrooien Maatschappij Activit.) 20531.

PROCESS OF OBTAINING BRIGHT SOAP, ETC., from resin.—A. E. Grabowski, and J. W. Milodrowski. (Poland, July 9, '37.) 20332.

MANUFACTURE OF HALOGENATED ACETALS of polyvinyl alcohol, etc.—W. W. Groves (I. G. Farbenindustrie.) 20270.

MANUFACTURE OF MEDICINAL IRON PREPARATIONS.—W. W. Groves (I. G. Farbenindustrie.) 20271.

MANUFACTURE OF ACYLACETIC ESTERS.—W. W. Groves (I. G. Farbenindustrie.) 20274.

MANUFACTURE OF TRIARYLMETHANE DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 20778.

MANUFACTURE OF MONO-AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 20780, 20781.

TREATMENT OF IRON ORES preliminary to smelting.—F. W. Harbord. 20354.

Specifications Open to Public Inspection

PROCESS AND APPARATUS FOR THE PRODUCTION OF METALLIC BARIUM.—I. G. Farbenindustrie. Jan. 9, 1937. 24816/37.

PROCESS FOR THE THERMAL PRODUCTION OF METALLIC BARIUM.—I. G. Farbenindustrie. Jan. 9, 1937. 25486/37.

PROCESS FOR THE SEPARATION OF TRIMETHYLAMINE from mixtures of monomethylamine and dimethylamine.—Rohm and Haas. Jan. 6, 1937. 34215/37.

PROCESS FOR THE MANUFACTURE OF EASILY WATER-SOLUBLE CALCIUM double salts of ascorbic acid.—Hoffman-La Roche and Co., A.-G., F. Jan. 8, 1937. 35694/37.

PRODUCTION OF DRYING-OILS.—Naamlooze Vennootschap Industrieele Maatschappij Voorheen Noury and Van Der Lande. Jan. 6, 1937. 52/38.

PROCESS FOR THE PRODUCTION OF ALKALINE EARTH METALS by thermal reduction.—Magnesium Elektron, Ltd. Jan. 7, 1937. 140/38.

MANUFACTURE OF CONDENSATION PRODUCTS.—Soc. of Chemical Industry in Basle. Jan. 9, 1937. 317/38.

LUMINESCENT MATERIALS.—British Thomson-Houston Co., Ltd. Jan. 8, 1937. 336/38.

PROCESS FOR THE PRODUCTION OF AMMONIUM-NITRATE and mixtures containing the same, and apparatus therefor.—Directie Van De Staatsmijnen in Limburg. Jan. 6, 1937. 338/38.

PRODUCTION OF HYDROCARBON MOTOR FUEL.—Process Management Co., Inc. Jan. 6, 1937. 346/38.

MANUFACTURE OF PLASTIC MASSES.—L. C. F. Pechin. Jan. 7, 1937. 515/37.

RECOVERY OF SULPHUR from used gas-purifying masses.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie. Jan. 9, 1937. 563/38.

CATALYSTS.—W. C. Heraeus Ges. Jan. 8, 1937. 620/38.

WORKING UP OF PRESSURE HYDROGENATION RESIDUES.—I. G. Farbenindustrie. Jan. 11, 1937. 731/38.

PROCESS FOR THE PURIFICATION OF LIQUIDS.—Naamlooze Vennootschap Octrooien Maatschappij Activit. Jan. 11, 1937. 753/38.

CONTINUOUS TREATMENT OF SOLID MATERIALS by means of solvents.—H. M. Lamy-Torrilhon. Jan. 11, 1937. 844/38.

Specifications Accepted with Dates of Application

MANUFACTURE OF ORGANIC NITROGENOUS CASE SALTS of sulphuric acid esters, and products thereof.—B. R. Harris. Nov. 5, 1936. 488,490.

MANUFACTURE AND PRODUCTION OF NITROGENOUS CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) Dec. 8, 1936. 488,553.

MANUFACTURE OF ISOQUINOLINE COMPOUNDS and derivatives thereof.—W. W. Groves (I. G. Farbenindustrie.) Jan. 4, 1937. 488,423.

PRODUCTION OF VALUABLE ORGANIC COMPOUNDS from carbonaceous materials by treatment with hydrogenating gases.—H. Dreyfus. Jan. 6, 1937. 488,609.

PROCESS OF AND APPARATUS FOR THE HEAT-TREATMENT OF SOLID CARBONACEOUS FUELS.—P. M. Schuftan. Jan. 8, 1937. (Cognate Application, 35468/37.) 488,567.

WETTING AND PENETRATING AGENTS for strong alkali lyes.—Chemical Works, formerly Sandoz. Jan. 9, 1936. 488,620.

ROASTING NICKEL MATTE.—N. S. Borch. Jan. 8, 1937. 488,568.

RECOVERY OF PHENOLS.—Bakelite, Ltd. June 30, 1936. 488,574.

THIAZOLIDINE DERIVATIVES.—I. G. Farbenindustrie. Jan. 11, 1936. 488,581.

REFRIGERANTS.—E. Damond. Sept. 17, 1936. 488,431.

PHOTOGRAPHIC DEVELOPERS.—W. W. Groves (I. G. Farbenindustrie.) Jan. 11, 1937. 488,374.

BLEACHING OF MONTAN WAX.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 4, 1937. 488,381.

MEANS FOR MANUFACTURING OF CARBIDES and other oxidisable substances.—G. Zotos. Feb. 12, 1936. 488,296.

TREATMENT OF BERYLLIUM ORES or compounds.—D. Gardner. March 1, 1937. 488,383.

MANUFACTURE OF ORGANIC MERCURY COMPOUNDS.—Fahlberg-List A.-G., Chemische Fabriken. April 24, 1936. 488,306.

PROCESS AND APPARATUS FOR RECOVERY OF CARBON DISULPHIDE or other solvents.—Carbonisation et Charbons Actifs. Feb. 27, 1937. 488,316.

PRODUCTION OF VALUABLE HYDROCARBONS by treatment with hydrogenating gases of high boiling carbonaceous materials which contain high molecular substances, such as asphalts and resins.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). April 12, 1937. 488,513.

MANUFACTURE OF SOAPS and like toilet preparations.—E. Schueller. April 16, 1937. 488,514.

ALLOYING OF METALS.—L. B. Pfeil. April 29, 1937. 488,322.

PURIFICATION OF GAS from oxide of nitrogen.—R. Mezger, and T. Payer. Aug. 21, 1936. 488,593.

AZO-DYESTUFFS.—Compagnie Nationale de Matieres Colarantes et Manufactures de Produits Chimiques du Nord Reuines Etablissements Kuhlman. May 29, 1936. 488,595.

PRODUCTION OF SHEET FORMATIONS of a leather-like character from fibres and polymerisation products of unsaturated organic compounds.—W. Freudenberg, H. Freudenberg, O. Freudenberg, and R. Freudenberg. June 20, 1936. 488,394.

2-HYDROXYMETHYL-1,3-DIOXOLANE.—Carbide and Carbon Chemicals Corporation. July 1, 1936. 488,327.

PROCESS FOR MANUFACTURING LUBRICANTS.—Naamlooze Vennootschap Bataafsche Petroleum Maatschappij. July 24, 1936. 488,597.

PRODUCTION OF GLYCERINE BY FERMENTATION.—H. Haehn. Oct. 31, 1936. 488,464.

MANUFACTURE OF UREA.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. Dec. 9, 1936. 488,404.

PROCESS FOR THE MANUFACTURE OF LUBRICANTS.—H. D. Elkington (Naamlooze Vennootschap de Batafsche Petroleum Maatschappij.) Jan. 10, 1938. 488,409.

Weekly Prices of British Chemical Products

CONDITIONS in the general chemical market this week have not been particularly active, most sections reporting only a quiet demand. Deliveries under existing contracts cover fair quantities, but so far as new business is concerned the market requirements appear to be satisfied. The price position remains unaltered, quotations continuing at recent levels. A steady seasonal demand is being put through for tartaric and citric acids and chlorate of soda but, taken on the whole, the market is without feature. Although a better interest is displayed in the coal tar products the general market position remains unaltered. A little better demand has been put through for creosote, but in other directions buying orders are scarce and quotations are very competitive.

MANCHESTER.—Price conditions in the Manchester market for both light and heavy chemicals during the past week have remained steady, and only in one or two instances has the tendency been easy. Industrial holidays in Lancashire and West Yorkshire have had a restrictive influence on the demand for contract deliveries, but apart from this and the slackness in the textile trades, movements into consumption are not unsatisfactory on the whole. New business this week has been on moderate lines, and the orders reported have included a few contracts extending over the next few months. There has been no improvement in the demand for tar products, and fresh bookings have been quiet, with the price tendency in several sections towards still cheaper levels.

GLASGOW.—Business in general chemicals has been rather quiet during the week on account of the local holidays, and export business also has been limited. Prices, however, continue very steady at about previous figures with no important changes to report.

Price Changes

Rises: Chrometan, liquor; copper sulphate (Manchester).

Falls: Cadmium Sulphide; cresylic acid, pale 99/100 per cent. (Manchester); dinitrobenzene; o-toluidine; p-toluidine.

General Chemicals

ACETONE.—**£45 to £47 per ton.**

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8¼d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3½d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £18 per ton f.o.b. SCOTLAND: £18 15s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 2s. 6d. to £5 2s. 6d. per cwt. according to quantity; in drums, £3 15s. 0d. to £4 7s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £30; brown, £29 10s.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 11¼d.

POTASSIUM PRUSSIATE.—6¼d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¾d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.
SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.
SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts.
SODIUM CHROMATE.—4¼d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4¼d. net, carriage paid.
SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.
SODIUM PRUSSIATE.—¼d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5¼d.
SODIUM SILICATE.—£8 2s. 6d. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.
ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—3s. 11d. to 4s. 2d. per lb.
CARBON BLACK.—3¼d. to 3 15/16d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 10½d. to 11d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4¾d. to 5¼d. per lb.; dark 3¾d. to 4¼d. per lb.
LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 7d. to 1s. 8d. per gal.; crude, 11d. to 1s. per gal.
CARBOLIC ACID.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 2s. to 2s. 3d.; dehydrated, 3s. to 3s. 3d. per gal. MANCHESTER: Crystals, 7d. to 7¼d. per lb. f.o.b. in drums; crude, 2s. 3d. per gal.
CREOSOTE.—Home trade, 4¾d. to 5d. per gal., f.o.r. makers' works; exports 6⅝d. to 6¾d. per gal., according to grade. MANCHESTER: 4¾d. to 5¼d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils 5¾d. to 6¼d.
CRESYLIC ACID.—97/99%, 1s. 10d. to 2s. 1d.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 2d. to 2s. 5d.; Dark, 95%, 1s. 7d. to 1s. 9d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 2s. 5d.
NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £5 5s. to £6 5s. per ton; purified crystals, £11 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £6 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £14 to £14 10s. per ton f.o.b.
PITCH.—Medium, soft, 33s. per ton, f.o.b. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
PYRIDINE.—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. 6d. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 9s. to 10s. per gal.
TOLUOL.—90%, 1s. 10d. per gal.: pure, 2s. 2d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £9 15s. per ton; grey, £9 5s. to £9 15s. MANCHESTER: Brown, £8 10s.; grey, £10.
METHYL ACETONE.—40.50%, £35 to £40 per ton.
WOOD CREOSOTE.—Unrefined, 4d. to 6d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 9½d. per lb.; 66/68° C., 11d.
DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 4¾d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—10½d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—11d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—1s. 11d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 8d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HARDINGS (PENDLETON), LTD (formerly Harding Chemical Co., Ltd.), Manchester. (M., 23/7/38.) July 12. £200 debentures, part of amount already registered. * £1,500. November 12, 1937.

MODERN FUELS, LTD., Seaham Harbour. (M., 23/7/37.) June 23, agreement authorising issue of £10,000 secured notes, to H.M. Treasury Solicitor; charged on land with carbonising plant, etc., at Seaham Harbour, also general charge.

O. ASHWORTH AND CO., LTD., Manchester, bleachers, dyers, etc. (M., 23/7/38.) July 8, debentures, to Union Bank of Manchester, Ltd., securing all moneys due or to become due to the Bank; general charge. * Nil. March 15, 1938.

SILVER SPRINGS BLEACHING AND DYEING CO., LTD., Congleton. (M., 23/7/38.) July 8, £4,000 4th debenture, to R. W. Heath, Biddulph; general charge. * £19,015. August 18, 1937.

VICTOR WOLF, LTD., Manchester, glycerine manufacturers. (M., 23/7/38.) July 5, £5,000 debenture, to Adolph Hess and Bro., Ltd.; general charge. * £4,000. July 9, 1937.

Satisfactions

ALUMINIUM INDUSTRIES, LTD., Lye. (M.S., 23/7/38.) Satisfactions July 11, of charge registered March 15, 1937, and of mortgage registered February 10, 1938.

LAWRY HAWKE AND CO., LTD., London, E.C., fertiliser manufacturers. (M.S., 23/7/38.) Satisfaction July 8, of debentures registered July 19, 1922.

Receiverships

CAPENETT, LTD., Birmingham, metal manufacturers. (R., 23/7/38.) Major W. Jervis, 5a Temple Row, Birmingham, has been appointed receiver. July 7.

PREMIER BLEACHING CO., LTD., Preston. (R., 23/7/38.) T. H: Bailey, 9 Chapel Street, Preston, has been appointed receiver. July 8.

New Companies Registered

Chrystalls (Chingford), Ltd. 342,419.—Private company. Capital £1,500 in 1,500 shares of £1 each. To carry on business as manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: Peter Collins Shearer, 12 The Broadway, Woodford Green, Essex; Eric W. McDonald.

E.F.U., Ltd. 342,424.—Private company. Capital £100 in 2,000 shares of 1s. each. To carry on business as manufacturers of and dealers in chemicals, gases, drugs, patent medicines, etc. Directors: Allan M. Horsburgh, "Stairways," Aylesbury, Bucks; John O. Martin, John S. Watts. Registered Office: 104 High Street, Tewkesbury, Glos.

Bridgewater Chemicals, Ltd. 342,350.—Private company. Capital £3,000 in 2,000 ordinary and 1,000 7½ per cent. preference shares of £1 each. To carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: Joseph W. Hewitt, 114 Liverpool Road, Patricroft, Manchester; John Gordon. Registered Office: 6 Brown Street, Manchester, 2.

Bowater-Lloyd (Newfoundland), Ltd. 342,414.—Public company. Capital £500,000 in 500,000 shares of £1 each. To acquire from Bowaters Paper Mills, Ltd., certain shares of the International Power and Paper Co., of Newfoundland, Ltd., and to carry on the business of manufacturers of and dealers in pulp, cellulose, paper and similar substances, and articles made therefrom; paper mill owners, manufacturers of papier mâché, cardboard, strawboard, millboard, wallboard and leatherboard products, shipowners, wharfingers, planters and producers of timber, wood and esparto and other grasses, manufacturers of phosphates, nitrates and fertilisers, etc. Subscribers: H. E. Walker, 2 Bond Court, Walbrook, E.C.4; C. A. Garrett.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Egypt.—The Commercial Counsellor to H.M. Embassy in Egypt reports that the Ministry of Agriculture, Crop Protection Section, Dokki, is calling for tenders, to be presented in Egypt by August 25, 1938, for the supply of chemicals, sprayers and dusters. (Ref. T.Y. 24572/38.)

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the South African Railways and Harbours Administration is calling for tenders, to be presented in South Africa by August 29, 1938, for the supply of approximately 33,800 gallons of disinfectant fluid. (Ref. T.Y. 24398/38.)

Chemical and Allied Stocks and Shares

FOLLOWING a reaction at the beginning of the week, the industrial section of the Stock Exchange developed a more buoyant tone, but on balance share values have moved moderately against holders. Sentiment has continued to be dominated largely by the fluctuations of Wall Street.

Imperial Chemical are 31s. 3d. at the time of writing, compared with 32s. 3d. a week ago, and British Oxygen 72s. 6d., compared with 73s. 6d., while Turner and Newall have gone back moderately to 79s. 6d. United Molasses at 22s. 4½d., Murex at 80s., and British Aluminium at 52s. 3d., were little changed. The shares of the last-named company tended to come in for attention on reports that production of aluminium is continuing to show a steady growth. Distillers were firm, having remained under the influence of the statements at the recent meeting, and at 98s. are within 6d. of the price ruling a week ago. Associated Cement have moved down from 84s. 4½d. to 81s. 10½d. and British Plaster Board made the slightly lower price of 26s. 3d. General Refractories at 14s. have lost their improvement of the previous week.

The general tendency in securities of iron, steel and kindred concerns was rather uncertain, but the shares of companies with important rearmament activities, such as Vickers and Hadfields were relatively steady. The interim dividend of the last-named is due shortly and the market is hopeful of a small increase in the payment. Dorman Long declined sharply, but Tube Investments have been fairly well maintained, aided by the view that, bearing in mind the higher interim paid earlier in the year, there is a possibility of the total dividend being raised to 25 per cent. The latter would compare with 23¾ per cent. paid in the previous year.

Fison, Packard and Prentice have again been firm around 34s. Following the reaction shown last week, Borax Consolidated were a steadier market and at 26s. 6d. are little changed on balance. United Glass Bottle ordinary transferred at the rather higher price of 49s. Largely as a result of the upward tendency of Wall Street, most of the internationally-dealt-in shares have made higher prices, including Swedish Match which are 26s., compared with 24s. 3d. a week ago. International Nickel were higher; although the quarterly statement is expected to show some reduction in earnings, the market is assuming that quarterly dividends will remain at 50 cents per share.

Courtaulds have moved down sharply on the week, due to the "cut" in the interim dividend, but at 28s. have shown some recovery from the lowest price touched in the past few days. Calico Printers were uncertain on doubts whether the results will announce a further payment on account of preference dividend arrears, and most textile shares moved moderately against holders.

Boots Drug at 42s. 3d. have lost 6d. on the week, and Timothy Whites and Taylors are 26s., compared with 27s. Sangers, which continued to show an improved tendency, are higher at 23s. 3d. British Drug Houses were unchanged at 22s. 6d. Beechams Pills reacted further to 60s., following their recent advance, the disposition in the market now being to await the capital scheme which is to be submitted in September. British Match at 33s. 3d. are within a few pence of the price current a week ago. Unilever have moved up moderately to 38s. 3d. Imperial Smelting were fairly steady at 11s. 6d. and were inclined to improve in sympathy with the price of zinc, although the market remains uncertain whether the dividend is likely to be kept at 5 per cent.

Oil shares became more active on Tuesday and subsequently moved in favour of holders. Trinidad Leaseholds, and other shares of companies with interests in Trinidad, attracted attention on the belief that later in the year important proposals may be announced for accelerating the development of the island's oil resources.